I claim:

1. A frequency and phase synchronizer system, comprising:

a processor for executing a sequence of operations, which include:

a) initializing a frequency error estimate value and phase error estimate value;

b) separating discrete samples of a continuous phase modulation signal into a first sequence of odd numbered samples of said signal, and a second sequence of even numbered samples of said signal;

c) determining an unknown frequency offset value from said first and second sequences, frequency error estimate, and phase error estimate;

d) determining an unknown phase offset value from said first and second sequences, frequency error estimate, phase error estimate, and a first discrete data sample of said discrete samples of said continuous phase modulation signal;

e) updating said frequency error estimate from said unknown frequency offset value; and

f) updating said phase error estimate from said unknown phase offset value.

2. The frequency and phase synchronizer system of claim 1 wherein said operations *b* through *f* are repeated an integral number of times.

3. The frequency and phase synchronizer system of claim 1 further including a digital receiver

for generating a frequency and phase corrected output signal in response to said digital receiver receiving said updated estimated frequency error estimate and said updated estimated phase error estimate

4. The frequency and phase synchronizer system of claim 1 wherein said unknown frequency offset value is determined by:

generating a first product by multiplying said first sequence of even numbered samples by a first parameter;

generating a first complex exponential value by applying a first discrete time voltage controlled oscillator to said frequency error estimate;

generating a second product by multiplying said first product and said first complex exponential value;

generating a third product by multiplying said second sequence of odd numbered samples by a second parameter;

generating a second complex exponential value by applying a second discrete time voltage controlled oscillator to said frequency error estimate;

generating a fourth product by multiplying said third product and said second complex exponential value;

generating a sequence of first sum signals $SUM1_l$ by adding said second and fourth products, where l is an index and $1 \le l \le N$ and N is a positive integer ;

generating a first accumulated sum *ASUM1*, where $ASUM1 = \sum_{1}^{N} SUM1_{l}$;

generating a fifth product by multiplying said first accumulated sum *ASUM1* by a third parameter;

generating a third complex exponential value in response to receiving said phase error estimate;

generating a sixth product having real and imaginary components by multiplying said third complex exponential value by said fifth product value; and

equating said unknown frequency offset value to said imaginary component of said sixth product to update said unknown frequency offset value.

5. The frequency and phase synchronizer system of claim 1 wherein said unknown phase value is determined by:

generating a seventh product by multiplying said first sequence of even numbered samples by a fourth parameter;

generating a fourth complex exponential value by applying a third discrete time voltage controlled oscillator to said frequency error estimate;

generating an eighth product by multiplying said seventh product and said fourth complex exponential value;

generating a ninth product by multiplying said second sequence of odd numbered samples by a fifth parameter;

generating a fifth complex exponential value by applying a fourth discrete time voltage controlled oscillator to said frequency error estimate;

generating a tenth product by multiplying said ninth product and said fifth complex exponential value;

generating a sequence of second signals $SUM2_l$ by adding said eighth and tenth products, where l is an index and $1 \le l \le N$ and N is a positive integer ;

generating a second accumulated sum *ASUM2*, where $ASUM2 = \sum_{1}^{N} SUM2_l$;

generating an eleventh product by multiplying said second accumulated sum *ASUM2* by a sixth parameter;

adding said first discrete data sample to said eleventh product to obtain a third sum value;

generating a sixth complex exponential value in response to receiving said phase error estimate;

generating a twelfth product having real and imaginary components by multiplying said sixth complex exponential value by said third sum value; and

equating said unknown phase offset value to said imaginary component of said twelfth product to update said unknown phase offset value.

6. The frequency and phase synchronizer system of claim 1 wherein said step of updating said frequency error estimate uses a time delayed frequency error estimate and a first step-size parameter.

7. The frequency and phase synchronizer system of claim 1 wherein said step of updating said phase error estimate uses a time delayed frequency error estimate and a second step-size parameter.

8. A method for providing frequency and phase synchronization of a continuous phase modulation signal, comprising the steps of:

a) initializing a frequency error estimate value and phase error estimate value;

b) separating discrete samples of a continuous phase modulation signal into a first sequence of odd numbered samples of said signal, and a second sequence of even numbered samples of said signal;

c) determining an unknown frequency offset value from said first and second sequences, frequency error estimate, and phase error estimate;

d) determining an unknown phase offset value from said first and second sequences, frequency error estimate, phase error estimate, and a first discrete data sample of said discrete samples of said continuous phase modulation signal;

e) updating said frequency error estimate from said unknown frequency offset value; and

f) updating said phase error estimate from said unknown phase offset value.

9. The method of claim 8 wherein said unknown frequency offset value is determined by:

generating a first product by multiplying said first sequence of even numbered samples by a first parameter;

generating a first complex exponential value by applying a first discrete time voltage controlled oscillator to said frequency error estimate;

generating a second product by multiplying said first product and said first complex exponential value;

generating a third product by multiplying said second sequence of odd numbered samples by a second parameter;

generating a second complex exponential value by applying a second discrete time voltage controlled oscillator to said frequency error estimate;

generating a fourth product by multiplying said third product and said second complex exponential value;

generating a sequence of first sum signals $SUM1_l$ by adding said second and fourth products, where l is an index and $1 \leq l \leq N$ and N is a positive integer ;

generating a first accumulated sum *ASUM1*, where $ASUM1 = \sum_{1}^{N} SUM1_l$;

generating a fifth product by multiplying said first accumulated sum *ASUM1* by a third

parameter;

generating a third complex exponential value in response to receiving said phase error estimate;

generating a sixth product having real and imaginary components by multiplying said third complex exponential value by said fifth product value; and

equating said unknown frequency offset value to said imaginary component of said sixth product to update said unknown frequency offset value.

10. The method of claim 8 wherein said unknown phase value is determined by:

generating a seventh product by multiplying said first sequence of even numbered samples by a fourth parameter;

generating a fourth complex exponential value by applying a third discrete time voltage controlled oscillator to said frequency error estimate;

generating an eighth product by multiplying said seventh product and said fourth complex exponential value;

generating a ninth product by multiplying said second sequence of odd numbered samples by a fifth parameter;

generating a fifth complex exponential value by applying a fourth discrete time voltage controlled oscillator to said frequency error estimate;

generating a tenth product by multiplying said ninth product and said fifth complex exponential value;

generating a sequence of second signals $SUM2_l$ by adding said eighth and tenth products, where l is an index and $1 \le l \le N$ and N is a positive integer ;

generating a second accumulated sum *ASUM2*, where $ASUM2 = \sum_{1}^{N} SUM2_l$;

generating an eleventh product by multiplying said second accumulated sum *ASUM2* by a sixth parameter;

adding said first discrete data sample to said eleventh product to obtain a third sum value;

generating a sixth complex exponential value in response to receiving said phase error estimate;

generating a twelfth product having real and imaginary components by multiplying said sixth complex exponential value by said third sum value; and

equating said unknown phase offset value to said imaginary component of said twelfth product to update said unknown phase offset value.

11. The method of claim 8 wherein said step of updating said frequency error estimate uses a time delayed frequency error estimate and a first step-size parameter.

12. The method of claim 8 wherein said step of updating said phase error estimate uses a time delayed frequency error estimate and a second step-size parameter.

13. A computer program product, comprising:

a computer usable medium having a computer readable program code embedded therein for causing a computer to execute a sequence of operations which include:

a) initializing a frequency error estimate value and phase error estimate value;

b) separating discrete samples of a continuous phase modulation signal into a first sequence of odd numbered samples of said signal, and a second sequence of even numbered samples of said signal;

c) determining an unknown frequency offset value from said first and second sequences, frequency error estimate, and phase error estimate;

d) determining an unknown phase offset value from said first and second sequences, frequency error estimate, phase error estimate, and a first discrete data sample of said discrete samples of said continuous phase modulation signal;

e) updating said frequency error estimate from said unknown frequency offset value; and

f) updating said phase error estimate from said unknown phase offset value.

14. The method of claim 13 wherein said sequence of operations for determining said unknown frequency offset value include:

generating a first product by multiplying said first sequence of even numbered samples by a first

parameter;

generating a first complex exponential value by applying a first discrete time voltage controlled oscillator to said frequency error estimate;

generating a second product by multiplying said first product and said first complex exponential value;

generating a third product by multiplying said second sequence of odd numbered samples by a second parameter;

generating a second complex exponential value by applying a second discrete time voltage controlled oscillator to said frequency error estimate;

generating a fourth product by multiplying said third product and said second complex exponential value;

generating a sequence of first sum signals $SUM1_l$ by adding said second and fourth products, where l is an index and $1 \le l \le N$ and N is a positive integer ;

generating a first accumulated sum *ASUM1*, where $ASUM1 = \sum_{1}^{N} SUM1_l$;

generating a fifth product by multiplying said first accumulated sum *ASUM1* by a third parameter;

generating a third complex exponential value in response to receiving said phase error estimate;

generating a sixth product having real and imaginary components by multiplying said third complex exponential value by said fifth product value; and

equating said unknown frequency offset value to said imaginary component of said sixth product to update said unknown frequency offset value.

15. The method of claim 13 wherein said said sequence of operations for determining said unknown phase value include:

generating a seventh product by multiplying said first sequence of even numbered samples by a fourth parameter;

generating a fourth complex exponential value by applying a third discrete time voltage controlled oscillator to said frequency error estimate;

generating an eighth product by multiplying said seventh product and said fourth complex exponential value;

generating a ninth product by multiplying said second sequence of odd numbered samples by a fifth parameter;

generating a fifth complex exponential value by applying a fourth discrete time voltage controlled oscillator to said frequency error estimate;

generating a tenth product by multiplying said ninth product and said fifth complex exponential value;

generating a sequence of second signals $SUM2_l$ by adding said eighth and tenth products, where l is an index and $1 \leq l \leq N$ and N is a positive integer ;

generating a second accumulated sum $ASUM2$, where $ASUM2 = \sum_{1}^{N} SUM2_l$;

generating an eleventh product by multiplying said second accumulated sum $ASUM2$ by a sixth parameter;

adding said first discrete data sample to said eleventh product to obtain a third sum value;

generating a sixth complex exponential value in response to receiving said phase error estimate;

generating a twelfth product having real and imaginary components by multiplying said sixth complex exponential value by said third sum value; and

equating said unknown phase offset value to said imaginary component of said twelfth product to update said unknown phase offset value.

16. The method of claim 13 wherein said sequence of operations for updating said frequency error estimate uses a time delayed frequency error estimate and a first step-size parameter.

17. The method of claim 13 wherein said sequence of operations for updating said phase error estimate uses a time delayed frequency error estimate and a second step-size parameter.